Review of
WATER QUALITY CRITERIA FOR THE HERBICIDES OXYFLUORFEN, PROMETRYN, SIMAZINE,
AND TRIFLURALIN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

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The Big Picture.

(a) In reading the Draft Water Quality Criteria Reports, are there any additional scientific issues that should be part of the scientific portion of the water quality criteria derivation that are not described above? If so, comment with respect to the derivation of water quality criteria.

In section 2 (physical-chemical data), it would be very helpful to add a short description of the chemical class, use category, and basic mode of action of each chemical. These are found in later sections, but it would be best if presented up front either in tabular or narrative form.

There is no (that I could find) solution for what to do if either an acute or chronic criterion cannot be derived. In two of the four cases (oxyfluoren and simazine) no acute criteria were derived due to lack of quality data. In the propose criterion statement, acute effects are ignored and only chronic values are stated. This seems to be a weakness that needs to be addressed or at least needs to provide guidance on what should be done next.

(b) Taken as a whole, are the scientific portions of the water quality criteria derivations based upon sound scientific knowledge, methods, and practices?

In my opinion, as a whole, the water quality derivations are based on sound science, methods, and practice. My only concern is for the development of acute criteria for plants from animal only data as described below.

Question 1. *The physical-chemical data for the herbicides are accurate and complete.*

Overall, as stated in (a) above, the criterion derivation document needs to provide additional information regarding chemical class, use category and MOA. In addition, there was a lack of consistency in reporting whether measurements were at STP, and it would be useful for across the board reporting of pKa since that helps give an indication of

environmental mobility. Finally, as discussed below, there were wide discrepancies in indicators of volatility that should be examined and justified.

Oxyfluoren: With the exception that temperatures were not reported for many of the data points and pKa was missing, the data appeared accurate and complete.

Prometryn: Vapor pressures reported from various sources are widely variant. It seems like the authors should do more exploration on this factor instead of just reporting a geometric mean.

Simazine: Criteria derivation authors need to address large differences in reported vapor pressures and Henry's Law constants (e.g., Henry's Law Constant reported in document to be 5.56×10^{-10} but the reference PPDB lists it as 5.6×10^{-5}). Authors need also to address differences in photolysis rates (382 v. 1.9) and hydrolysis rates (>28d v 96d) between the document and PPDB.

Trifluralin: Henry's Law Constant is very different in the document (1.3×10^{-4}) compared to the reference PPDB (10.2).

Question 2. *Ecotoxicity data screening resulted in a high quality (relevant and reliable) data set for criteria derivation and did not result in removal of pertinent high quality data from the data set used for criteria derivation.*

I did not look up and compare all references cited (nor were they all available) to ensure that there were no data errors. I assume that data entry was reviewed and QA'd prior to release of the draft criteria. The basis for rating data screened in the evaluation was scientifically valid, and data reduction methods were appropriate and applied consistently across chemicals. Thus, I do not believe that pertinent high quality data were removed and the best data available were used to derive the criteria.

Question 3. *It is scientifically sound to derive an acute criterion for an herbicide using acute animal toxicity data and the acute criterion calculated is technically valid.*

I do not think there is enough evidence to state unequivocally that this approach is sound or valid. To use the argument that all plant based toxicity test endpoints are chronic and thus only acute animal tests can be used to determine the safety of short term (1 hr), high level excursions is circular and not logical. Authors need to explore this assumption in more detail.

For example, a quick search of the literature revealed a periphyton community exposure to prometryn (Schmitt-Jansen and Altenburger, 2005). The exposure was for 1 hour (the pulse exposure time used for acute criteria derivation) and the endpoint was chlorophyll fluorescence. In the authors' view, this would count as a chronic endpoint regardless of such a short exposure. I disagree. The EC50 for prometryn in this exposure was 100 µg/L.

The acute water quality criterion proposed in the criterion document is based on rainbow trout and is listed as 228 μg/L – more than 2x the EC50 for periphyton and would have caused >60% inhibition of photosynthesis based on the published concentration response relationship. I note that this publication is relatively recent, is in a top-rated journal, is relevant to the criterion development, was easy to find on Google Scholar, and was not cited as a reference in the criterion document.

I did not go through this exercise for all of the herbicides, but it is clear that at least in this case, the use of acute animal studies is not protective of periphyton communities in short-term, 1-hour exposures.

Schmitt-Jansen, M., Altenburger, R. 2005. Predicting and observing responses of algal communities to photosystem II herbicide exposure using pollution-induced community tolerance and species-sensitivity distributions. Environ. Toxicol. Chem. 24(2): 304-312.

Question 4. *It is scientifically sound to derive a chronic criterion for an herbicide using only alga or vascular aquatic plant toxicity data if those taxa are more sensitive than animals, or using only animal toxicity data if those taxa are more sensitive than plants, and the chronic criteria calculated are technically valid.*

When chronic studies of both plants and animals are available and can be compared, setting the chronic criterion for an herbicide using the most sensitive species is technically and scientifically valid.

Question 5. *The water quality criteria were not adjusted based on water quality effects, specific ecotoxicity data, or effects in other environmental compartments; the derived criteria are scientifically sound and technically valid based on the available information on these topics.*

With the accompanying narrative provided in the criteria documents, I believe that in all cases the authors did an admirable job in defense of not adjusting the criteria.

Question 6. *The assumptions, limitations, and uncertainties regarding derivation of the water quality criteria are accurate and include all factors that significantly affect the resulting criteria.*

With the accompanying narrative provided in the criteria documents, I believe that in all cases the authors clearly outlined the major assumptions, limitations, and uncertainties and included all factors that significantly affect the resulting criteria – with the exception of deriving acute criteria from animal data alone (as described above).